

A PROCESS FOR CONVERTING COAL INTO FUEL CELL QUALITY  
HYDROGEN AND SEQUESTRATION-READY CARBON DIOXIDE

## ABSTRACT OF THE DISCLOSURE

[0044] A process for burning coal to produce substantially pure hydrogen for use in fuel cells, together with "sequestration ready" carbon dioxide and a stream of oxygen depleted air for powering gas turbines, characterized by using a combination of two fluidized bed reactors and a third transfer line reactor, the first reactor being supplied with coal particles or "char" and fluidized with high temperature steam; the second reactor being fluidized with high temperature steam and the third reactor being fluidized by compressed air. Solids circulated among these three reactors include a mixture of materials containing calcium compounds (present as  $\text{CaO}$ ,  $\text{CaCO}_3$  and mixtures thereof) and iron compounds (present as  $\text{FeO}$ ,  $\text{Fe}_2\text{O}_3$  and mixtures thereof). The coal is gasified by the steam in the presence of  $\text{CaO}$  to produce  $\text{CaCO}_3$  and relatively pure hydrogen for use in fuel cells per a  $\text{CO}_2$  acceptor process. Because only part of the coal char input to the first reactor is gasified to produce hydrogen, the remainder can be burned to supply thermal energy necessary to regenerate the  $\text{CaCO}_3$  back to  $\text{CaO}$ . Carbon in the middle bed fluidized bed reactor reacts with  $\text{Fe}_2\text{O}_3$  in the third reactor and the temperature in the middle fluidized bed reactor is sufficiently high to decompose  $\text{CaCO}_3$  back into  $\text{CaO}$ .